DECLARED DISTANCES

OVERVIEW AND APPLICATIONS

By George Legarreta
FAA Office of Airport Safety and Standards

26th Annual Airport Conference
Sponsor Great Lakes Airports Division

Chicago, Ill
November 4 , 2010

Federal Aviation Administration

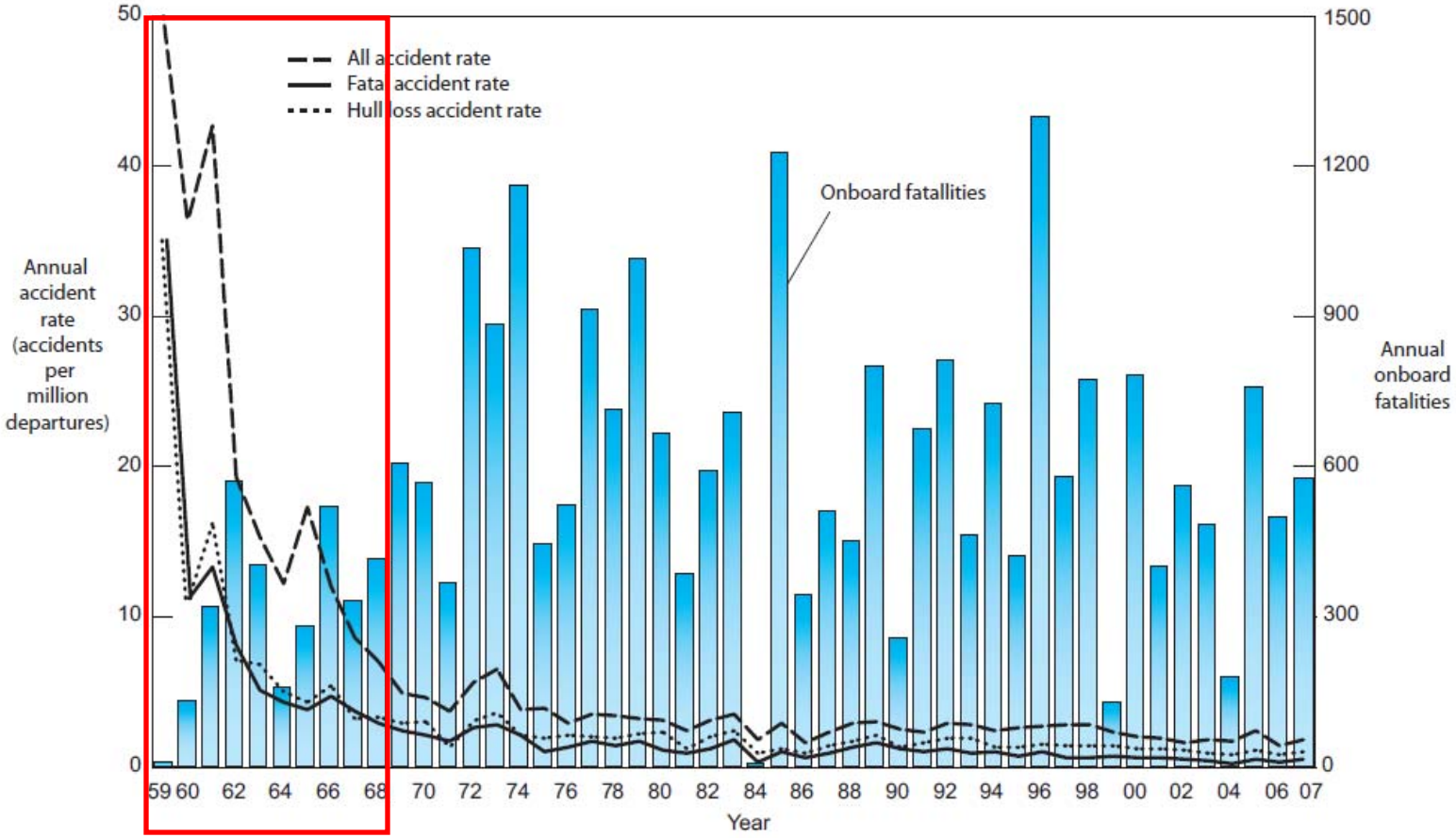
Part I

The Early Years

Late 60s

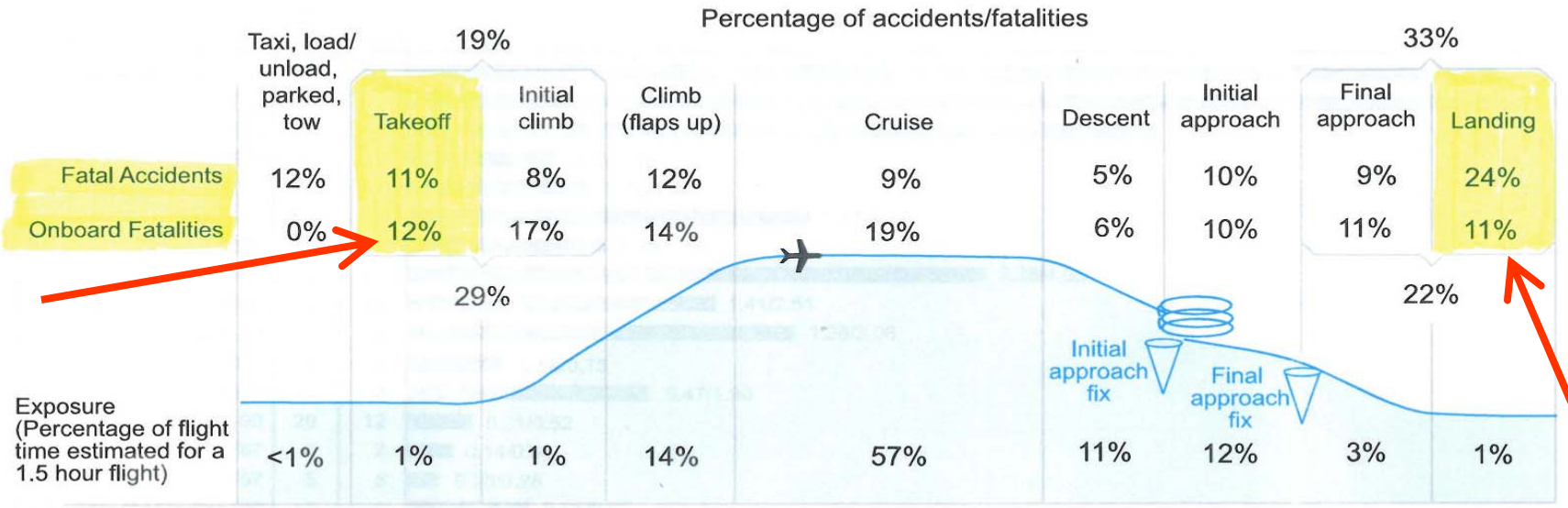
Where did Declared Distances come from ?

Accident Rates and Onboard Fatalities by Year
Worldwide Commercial Jet Fleet – 1959 Through 2007

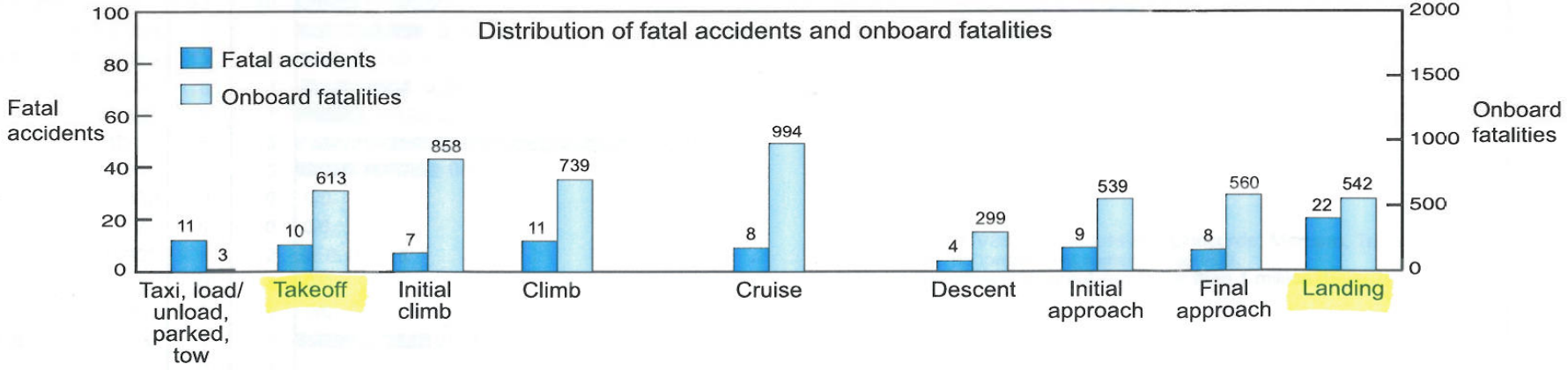


BOEING

Fatal Accidents and Onboard Fatalities by Phase of Flight
Worldwide Commercial Jet Fleet – 1998 Through 2007



Percentages may not sum to 100% due to numerical rounding.



34% ALL FATALITIES 23% ONBOARD FATALITIES

BOEING

Some Present Day Statistics

- ***Around the world, there is on average 1 overrun accident every 8.5 days***
  - ***Over 50% result in significant aircraft damage or hull loss***
  - ***Over 10% result in fatalities***
  - ***In 2007, 50% of all aviation fatalities were due to aircraft overruns [220 fatalities]***
  - ***Since 1997 overruns have resulted in many more accidents and clamed more lives than runway incursions***
  - ***Between 1997 -2006 (10 years)***
    - ***Overruns are the 4th largest cause of fatalities worldwide (> 260)***
    - ***Runway incursions are ranked 9th (110 fatalities)***

- ***United Nations - International Civil Aviation Organization (ICAO) Adopts Declared Distance Concept***
  - ***Amendment #23 to ANNEX 14, "International Standards and Recommended Practices - Aerodromes," dated 23 January 1969***
  - ***United States (ICAO Member) endorses concept***

ICAO'S PURPOSE

- ***Standardize the Calculation and Reporting of Available Runway Lengths for use by International Air Transport:***
  - ***Takeoff Run Available - TORA***
  - ***Takeoff Distance Available - TODA***
  - ***Accelerate-Stop Distance Available - ASDA***
  - ***Landing Distance Available - LDA***

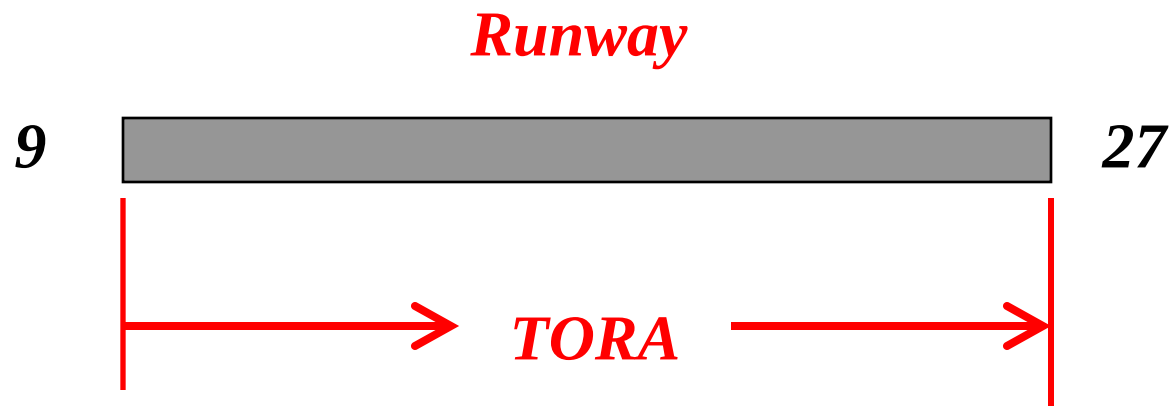
Airport Operator's Task: Report 8 declared distances - based on direction of operation

9	Runway Length 5000 FEET	27

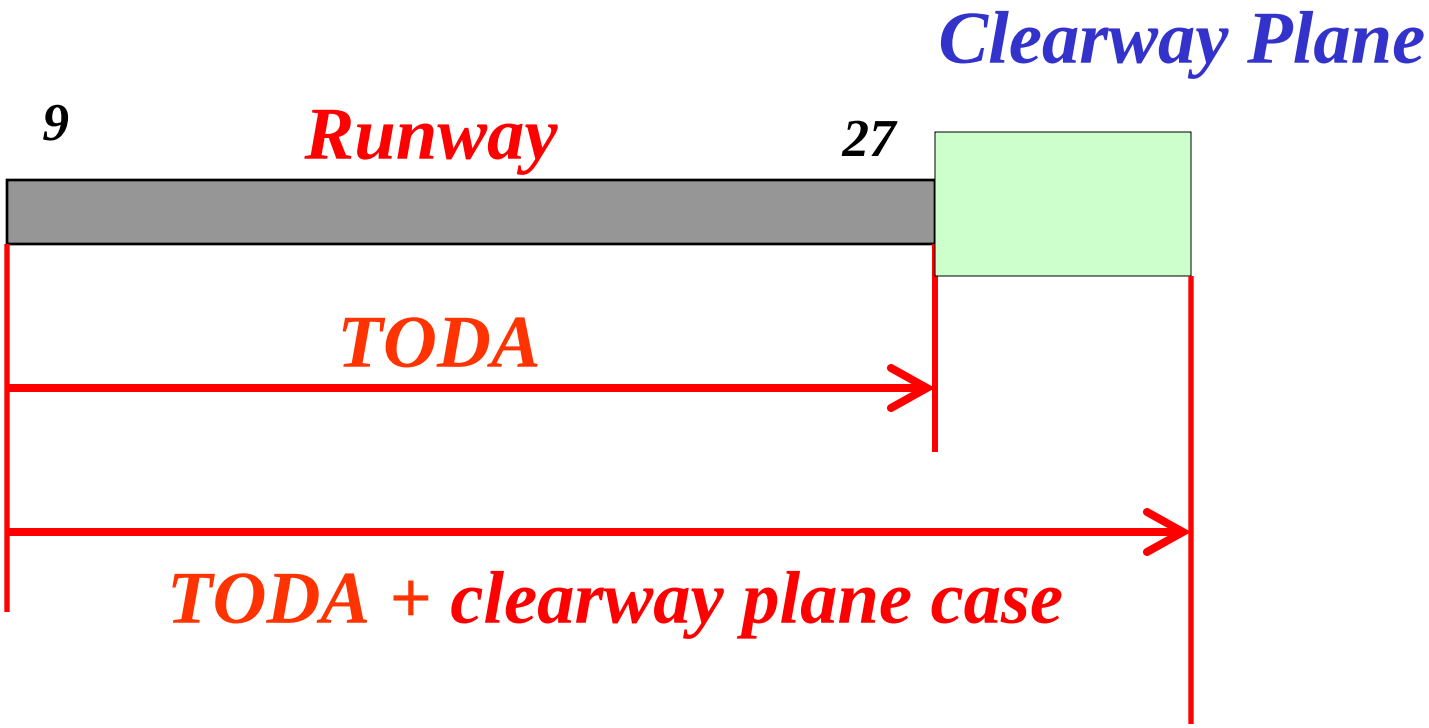
	TORA Feet	*TODA Feet*	*ASDA Feet*	*LDA Feet*
9	?	?	?	?
27	?	?	?	?

– ***Takeoff Run Available (TORA)*** ***– the length of runway available and suitable for the ground run of an airplane taking off***

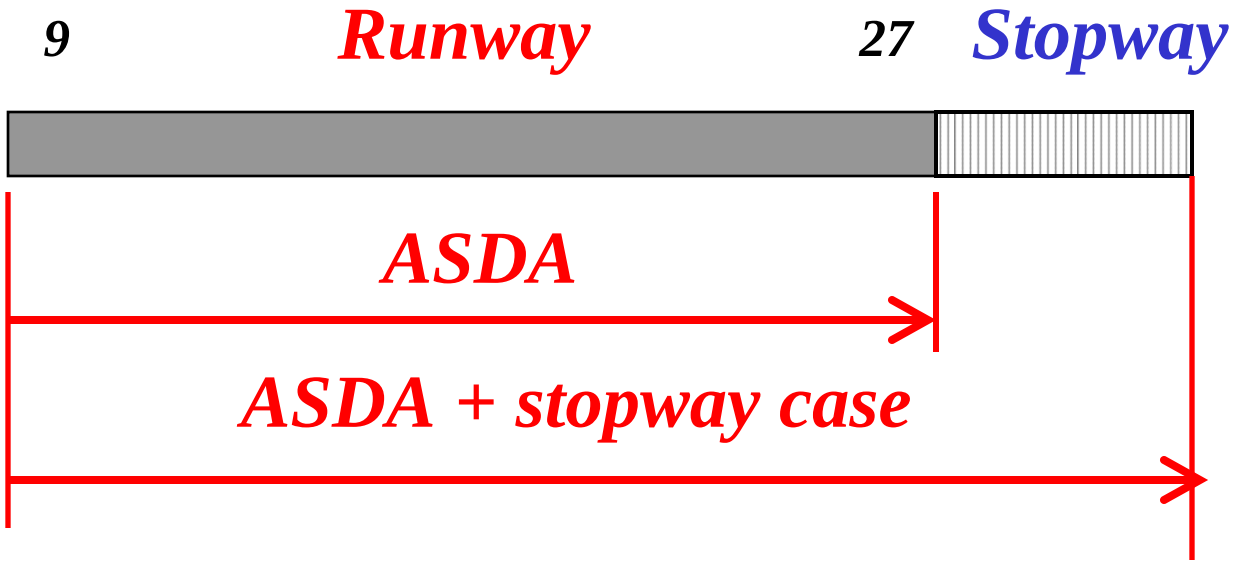
“ in nearly all cases the physical pavement ”



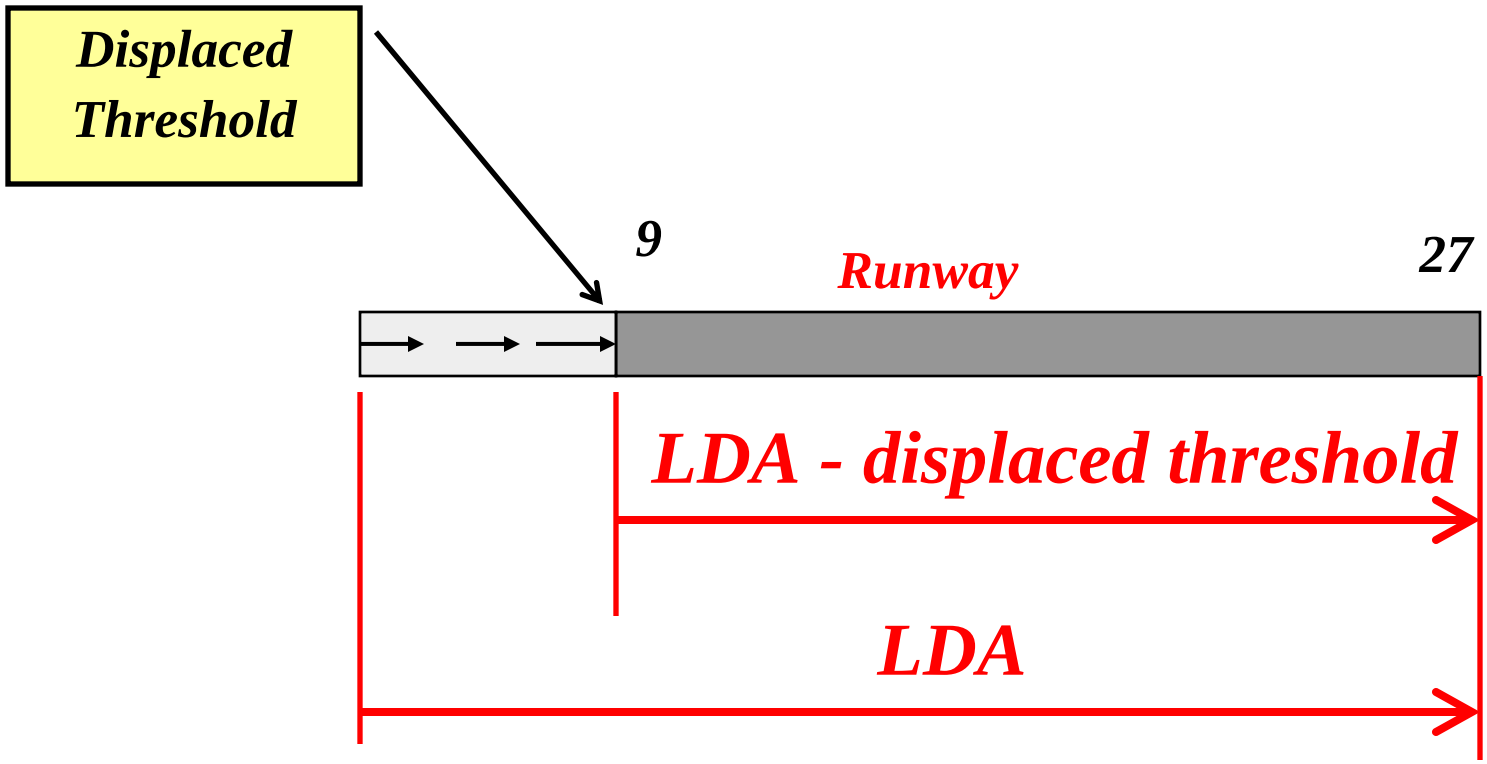
– ***Takeoff Distance Available (TODA)*** **– *the length of the TORA available plus the length of the clearway, if provided***



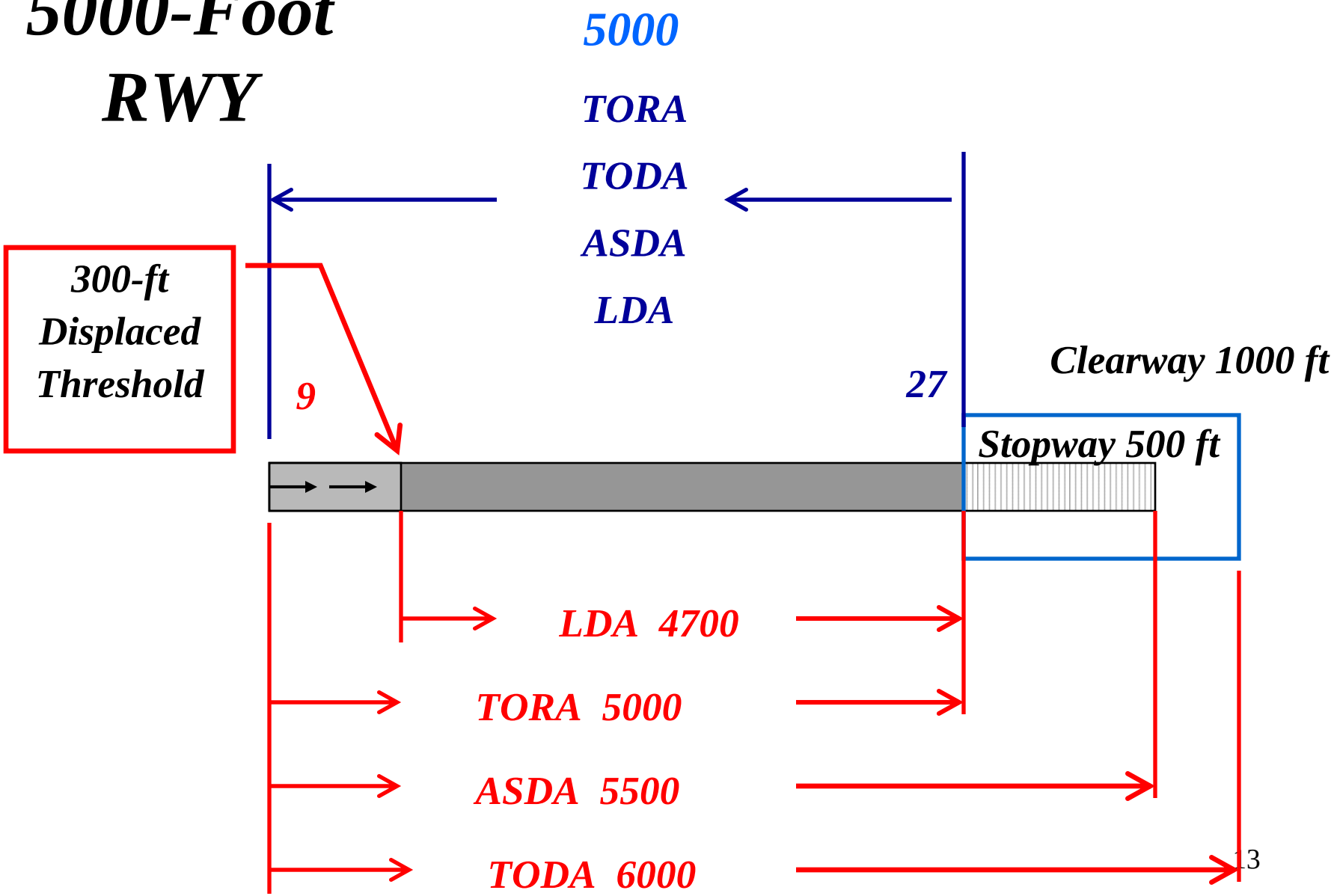
– ***Accelerate-Stop Distances Available (ASDA) – the length of the TORA plus the length of the stopway, if provided for the acceleration and deceleration of an airplane aborting a takeoff***



– ***Landing Distance Available (LDA)*** **– *the length of runway declared available and suitable for landing an airplane***



Example 5000-Foot RWY

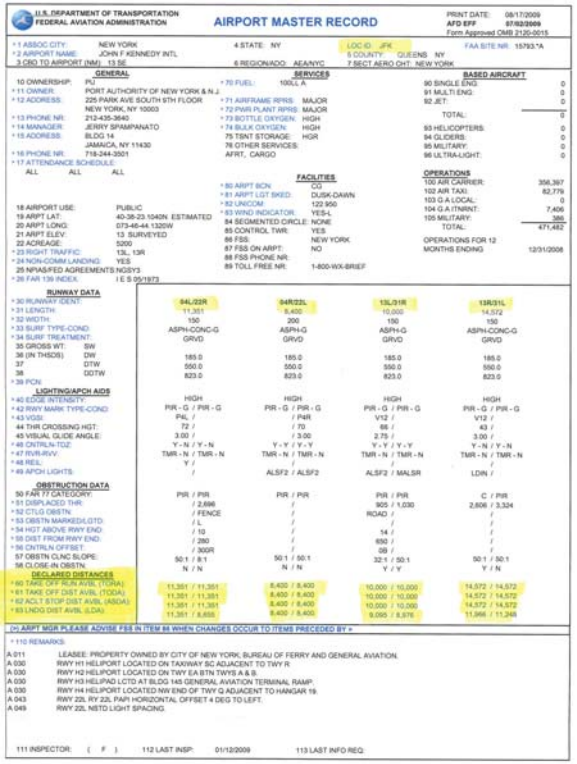


Rwy 9/27 Declared Distances

Runway End	*TORA ft*	*TODA ft*	*ASDA ft*	*LDA ft*
9	*5000*	*6000*	*5500*	*4700*
27	*5000*	*5000*	*5000*	*5000*

Airport operators submit these values to their FAA Region/ADO for review and approval. Approved values are then shown on the Approved ALP and other Government Docs.

JFK Airport Master Record FAA Form 5010-1



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AIRPORT MASTER RECORD

PRINT DATE: 08/17/2009
AFD EFF 07/02/2009
Form Approved OMB 2120-0015

LOC ID: JFK
FAA SITE NR: 15793.*A

1 ASSOC CITY: NEW YORK
2 AIRPORT NAME: JOHN F KENNEDY INTL
3 CBD TO AIRPORT (NM): 13 SE
4 STATE: NY
5 COUNTY: QUEENS NY
6 REGION/ADO: AEA/NYC
7 SECT AERO CHT: NEW YORK

GENERAL

10 OWNERSHIP: PU
11 OWNER: PORT AUTHORITY OF NEW YORK & N.J.
12 ADDRESS: 225 PARK AVE SOUTH 9TH FLOOR NEW YORK, NY 10003
13 PHONE NR: 212-435-3640
14 MANAGER: JERRY SPAMPANATO
15 ADDRESS: BLDG 14 JAMAICA, NY 11430
16 PHONE NR: 718-244-3501
17 ATTENDANCE SCHEDULE: ALL ALL ALL
18 AIRPORT USE: PUBLIC
19 ARPT LAT: 40-38-23.1040N ESTIMATED
20 ARPT LONG: 073-46-44.1320W
21 ARPT ELEV: 13 SURVEYED
22 ACREAGE: 5200
23 RIGHT TRAFFIC: 13L, 13R
24 NON-COMM LANDING: YES
25 NPIAS/FED AGREEMENTS: NGSY3
26 FAR 139 INDEX: I E S 05/1973

SERVICES

70 FUEL: 100LL A
71 AIRFRAME RPRS: MAJOR
72 PWR PLANT RPRS: MAJOR
73 BOTTLE OXYGEN: HIGH
74 BULK OXYGEN: HIGH
75 TSNT STORAGE: HGR
76 OTHER SERVICES:
AFRT, CARGO

FACILITIES

80 ARPT BCN: CG
81 ARPT LGT SKED: DUSK-DAWN
82 UNICOM: 122.950
83 WIND INDICATOR: YES-L
84 SEGMENTED CIRCLE: NONE
85 CONTROL TWR: YES
86 FSS: NEW YORK
87 FSS ON ARPT: NO
88 FSS PHONE NR:
89 TOLL FREE NR: 1-800-WX-BRIEF

BASED AIRCRAFT

90 SINGLE ENG: 0
91 MULTI ENG: 0
92 JET: 0
TOTAL: 0
93 HELICOPTERS: 0
94 GLIDERS: 0
95 MILITARY: 0
96 ULTRA-LIGHT: 0

OPERATIONS

100 AIR CARRIER: 356,397
102 AIR TAXI: 82,779
103 G.A.LOCAL: 0
104 G.A.ITINRNT: 7,406
105 MILITARY: 380
TOTAL: 471,482
OPERATIONS FOR 12 MONTHS ENDING: 12/31/2008

RUNWAY DATA

	04L/22R	04R/22L	13L/31R	13R/31L
30 RUNWAY IDENT:				
31 LENGTH:	11,351	8,400	10,000	14,572
32 WIDTH:	150	200	150	150
33 SURF TYPE-COND:	ASPH-CONC-G	ASPH-G	ASPH-G	ASPH-CONC-G
34 SURF TREATMENT:	GRVD	GRVD	GRVD	GRVD
35 GROSS WT: SW	185.0	185.0	185.0	185.0
36 (IN THSDS) DW	550.0	550.0	550.0	550.0
37 DTW	823.0	823.0	823.0	823.0
38 DDTW				
39 PCN:				
LIGHTING/APCH AIDS				
40 EDGE INTENSITY:	HIGH	HIGH	HIGH	HIGH
42 RWY MARK TYPE-COND:	PIR - G / PIR - G	PIR - G / PIR - G	PIR - G / PIR - G	PIR - G / PIR - G
43 VGSI:	P4L /	/ P4R	V12 /	V12 /
44 THR CROSSING HGT:	72 /	/ 70	66 /	43 /
45 VISUAL GLIDE ANGLE:	3.00 /	/ 3.00	2.75 /	3.00 /
46 CNTRLN-TDZ:	Y - N / Y - N	Y - Y / Y - Y	Y - Y / Y - Y	Y - N / Y - N
47 RVR-RVV:	TMR - N / TMR - N	TMR - N / TMR - N	TMR - N / TMR - N	TMR - N / TMR - N
48 REIL:	Y /	/	/	/
49 APCH LIGHTS:	/	ALSF2 / ALSF2	ALSF2 / MALSR	LDIN /
OBSTRUCTION DATA				
50 FAR 77 CATEGORY:	PIR / PIR	PIR / PIR	PIR / PIR	C / PIR
51 DISPLACED THR:	/ 2,686	/	905 / 1,030	2,606 / 3,324
52 CTLG OBSTN:	/ FENCE	/	ROAD /	/
53 OBSTN MARKED/LGTD:	/ L	/	/	/
54 HGT ABOVE RWY END:	/ 10	/	14 /	/
55 DIST FROM RWY END:	/ 280	/	650 /	/
56 CNTRLN OFFSET:	/ 300R	/	0R /	/
57 OBSTN CLNC SLOPE:	50:1 / 8:1	50:1 / 50:1	32:1 / 50:1	50:1 / 50:1
58 CLOSE-IN OBSTN:	N / N	N / N	Y / Y	Y / N
DECLARED DISTANCES				
60 TAKE OFF RUN AVBL (TORA):	11,351 / 11,351	8,400 / 8,400	10,000 / 10,000	14,572 / 14,572
61 TAKE OFF DIST AVBL (TODA):	11,351 / 11,351	8,400 / 8,400	10,000 / 10,000	14,572 / 14,572
62 ACLT STOP DIST AVBL (ASDA):	11,351 / 11,351	8,400 / 8,400	10,000 / 10,000	14,572 / 14,572
63 LNDG DIST AVBL (LDA):	11,351 / 8,655	8,400 / 8,400	9,095 / 8,976	11,966 / 11,248

(H) ARPT MGR PLEASE ADVISE FSS IN ITEM 84 WHEN CHANGES OCCUR TO ITEMS PRECEDED BY »

110 REMARKS:

A 011 LEASEE: PROPERTY OWNED BY CITY OF NEW YORK; BUREAU OF FERRY AND GENERAL AVIATION.
A 030 RWY H1 HELIPORT LOCATED ON TAXIWAY SC ADJACENT TO TWY R
A 030 RWY H2 HELIPORT LOCATED ON TWY EA BTN TWYS A & B.
A 030 RWY H3 HELIPAD LCTD AT BLDG 145 GENERAL AVIATION TERMINAL RAMP.
A 030 RWY H4 HELIPORT LOCATED NW END OF TWY Q ADJACENT TO HANGAR 19.
A 043 RWY 22L RY 22L PAPI HORIZONTAL OFFSET 4 DEG TO LEFT.
A 049 RWY 22L NSTD LIGHT SPACING.

111 INSPECTOR: (F) 112 LAST INSP: 01/12/2009 113 LAST INFO REQ:

FAA Form 5010-1 (5-91) SUPERSEDES PREVIOUS EDITION

Rwy

4L/22R

DECLARED DISTANCES	4L/22R	4R/22L	13L/31R	13R/31L
60 TAKE OFF RUN AVBL (TORA):	11,351 / 11,351	8,400 / 8,400	10,000 / 10,000	14,572 / 14,572
61 TAKE OFF DIST AVBL (TODA):	11,351 / 11,351	8,400 / 8,400	10,000 / 10,000	14,572 / 14,572
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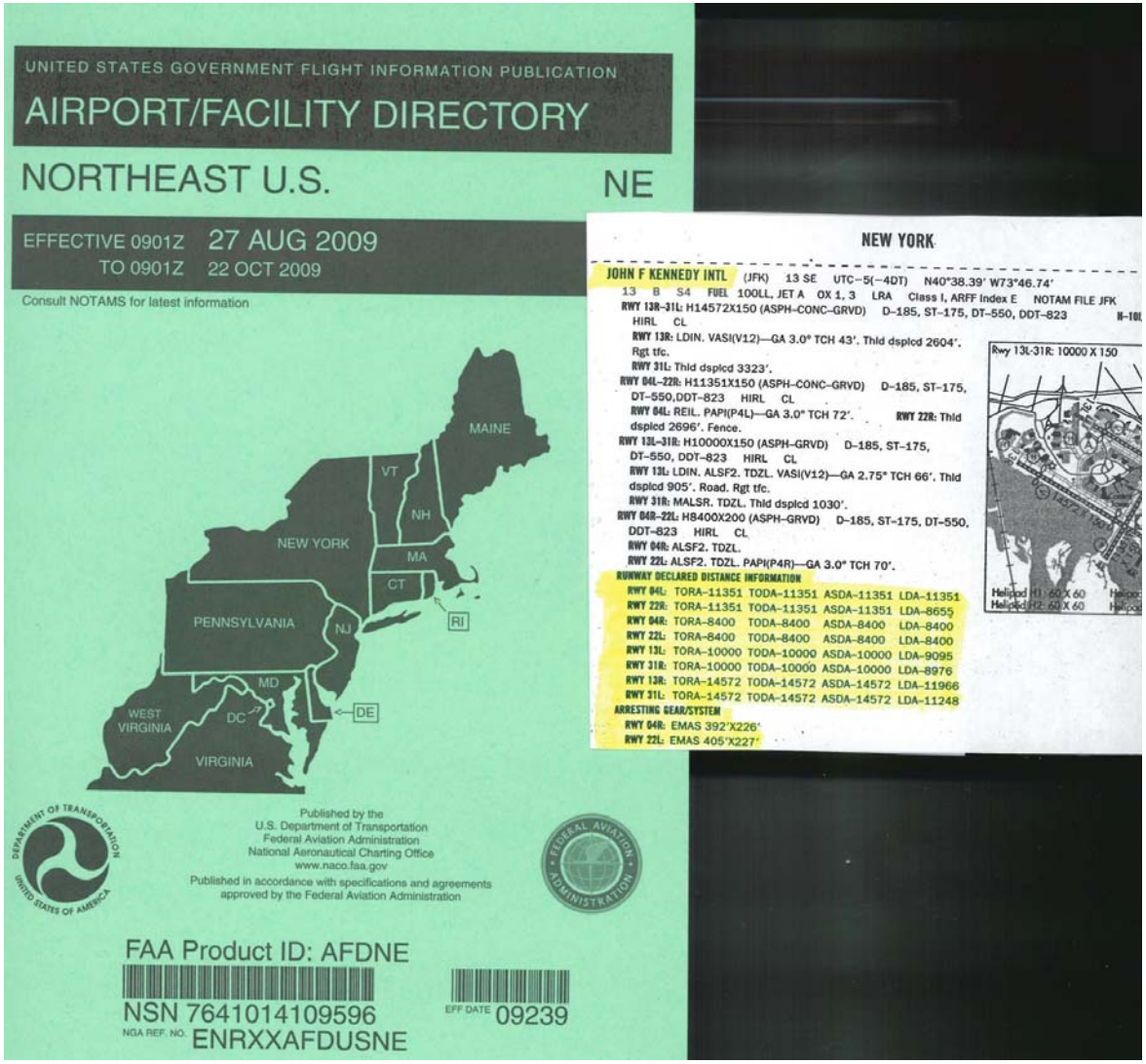
63 LNDG DIST AVBL (LDA):	11,351 / 8,655	8,400 / 8,400	9,095 / 8,976	11,966 / 11,248

Airport/Facilities Directory A/FD
U.S. Government Publication



Part II

The 70s and Early 80s

US FAA Airports
And
The Decision Years

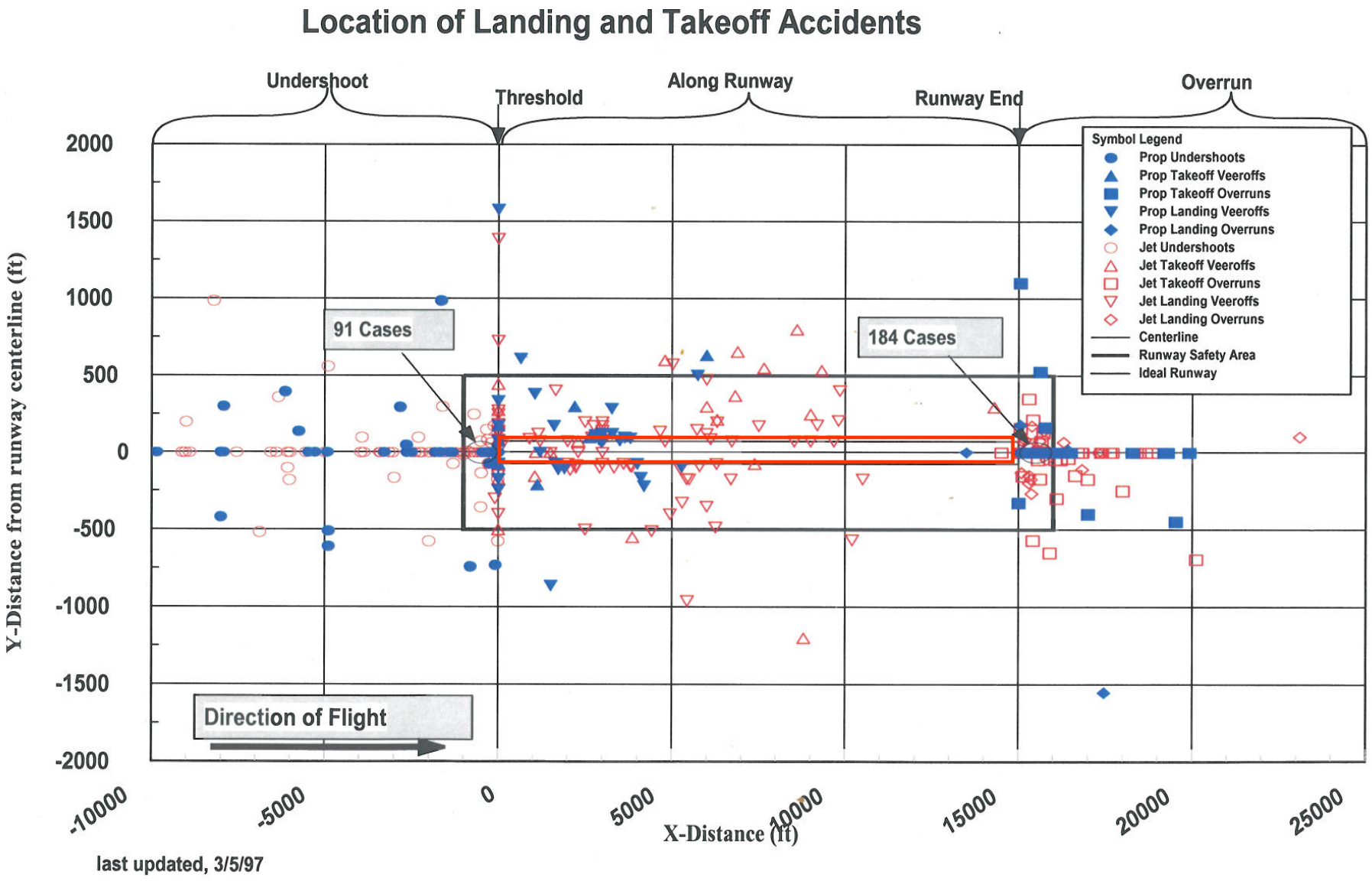
How to deal with this?


F81
F81

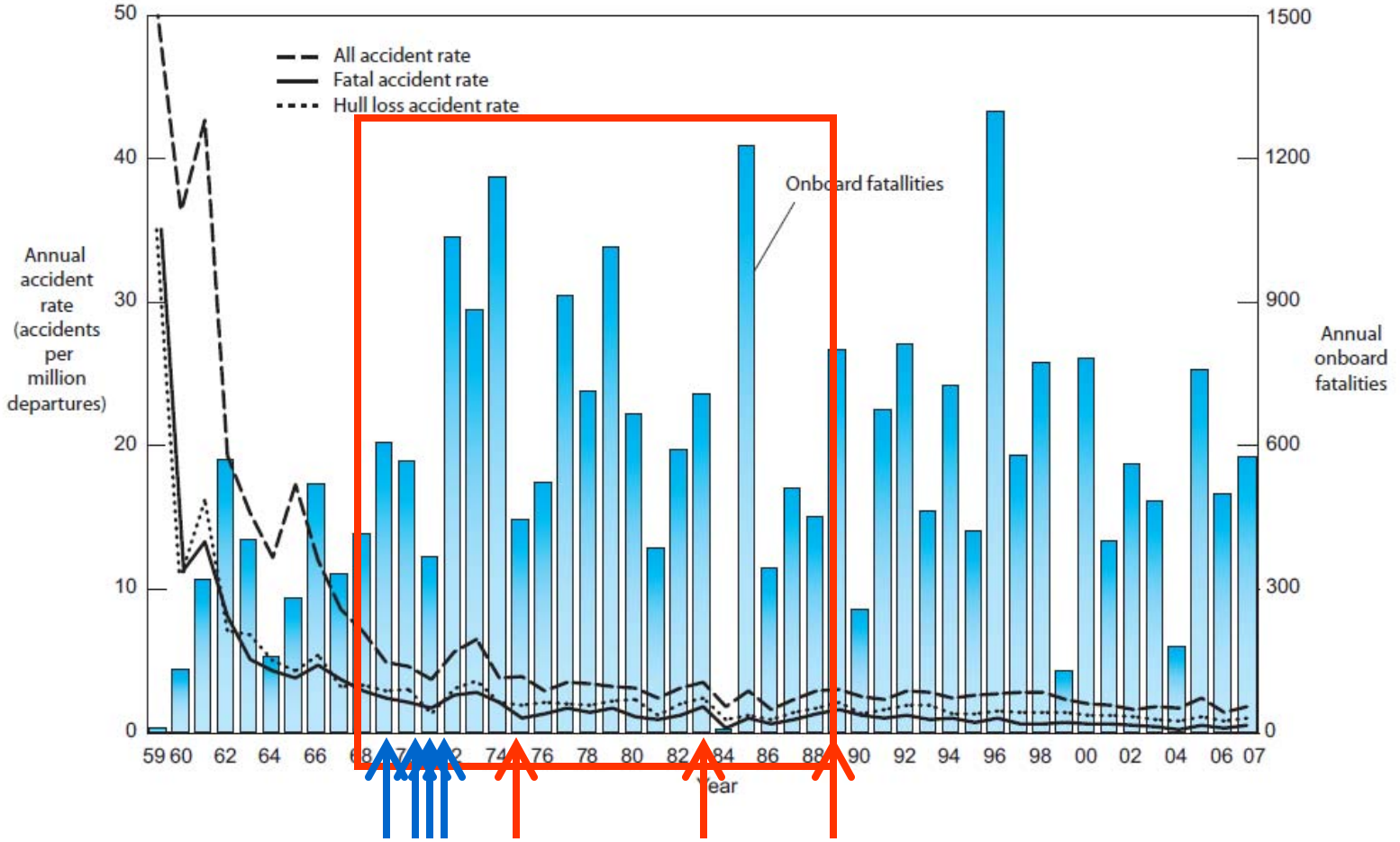
Toronto, Canada August 2, 2005
No Fatalities

650 feet from

end of runway


Location of Landing and Takeoff Accidents
Undershoot
Threshold
Along Runway
Runway End
Overrun
Symbol Legend
Prop Undershoots
Prop Takeoff Veeroffs
Prop Takeoff Overruns
Prop Landing Veeroffs
Prop Landing Overruns
Jet Undershoots
Jet Takeoff Veeroffs
Jet Takeoff Overruns
Jet Landing Veeroffs
Jet Landing Overruns
Centerline
Runway Safety Area
Ideal Runway
91 Cases
184 Cases
Direction of Flight
Y-Distance from runway centerline (ft)
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-10000
-5000
0
5000
10000
15000
20000
25000
X-Distance (ft)
last updated, 3/5/97

Accident Rates and Onboard Fatalities by Year
Worldwide Commercial Jet Fleet – 1959 Through 2007



What "Tools" do we have to minimize USA fatality rate ?

16
2007 STATISTICAL SUMMARY, JULY 2008

BOEING

Significant USA Actions to Minimize the Effects of Overruns, Veeroffs, Undershoots

- ***1975 - Longer Runway Safety Areas For Jets over 60,000 lbs, Approach Categories C and D***
  - ***Introduced the concept of Extended Runway Safety Area - added 800 ft to the 200-foot standard***
- ***1983 – We elevated RSA Std = 1,000 ft hard***
- ***1989 - We introduced a "Marriage" between Declared Distances & Runway Safety Areas***
  - ***New AC 150 / 5300 – 13, Airport Design***

Declared Distances "Married" with Runway Safety Area

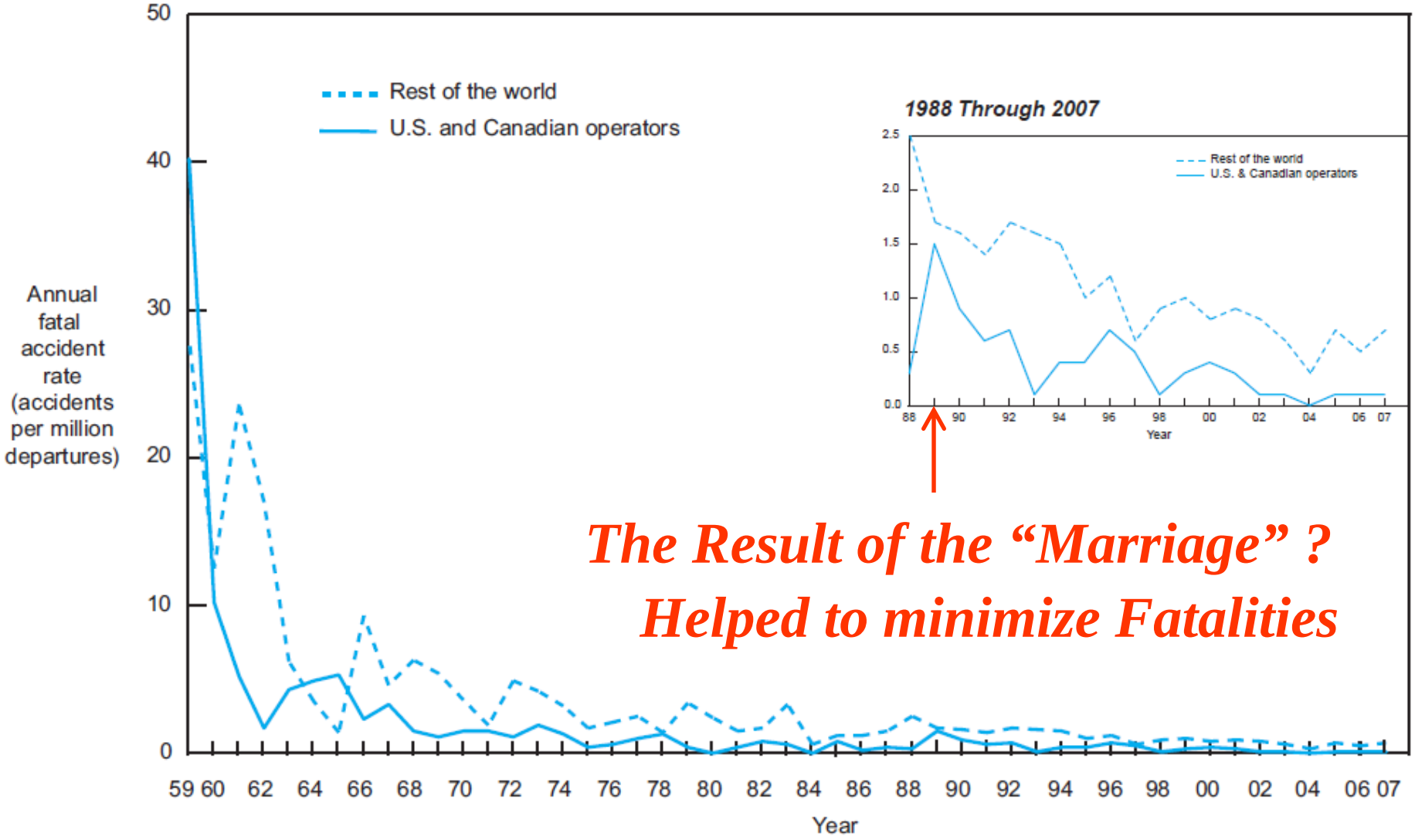
- ***TORA and TODA untouched***

- ***ASDA for Aborted Takeoffs [1 RSA off the end]***
- ***LDA for Undershoots and Overruns [2 RSAs]***

- ***Insufficient RSA off a Runway End implies:***
  - ***Reduced ASDA [to the extent practicable]***
  - ***Reduced LDA [to the extent practicable]***

U.S. and Canadian Operators Accident Rates by Year

Fatal Accidents – Worldwide Commercial Jet Fleet – 1959 Through 2007



The Result of the "Marriage" ?

Helped to minimize Fatalities

Part III

Example
FAA Application
Sub-standard RSA

(RSA Std = 1,000 feet)

- *RWY 17/35 = 8,000 feet with RSA STD = 1,000 ft*
  - *Substd RSA off Rwy End 17 = 800 ft*
  - *Substd RSA off Swy End 35 = 800 ft*
  - *Displaced Threshold for Rwy 17 = 275 ft*
  - *ROFA complies with standard = 1,000 ft*
  - *All RPZs comply with standard*

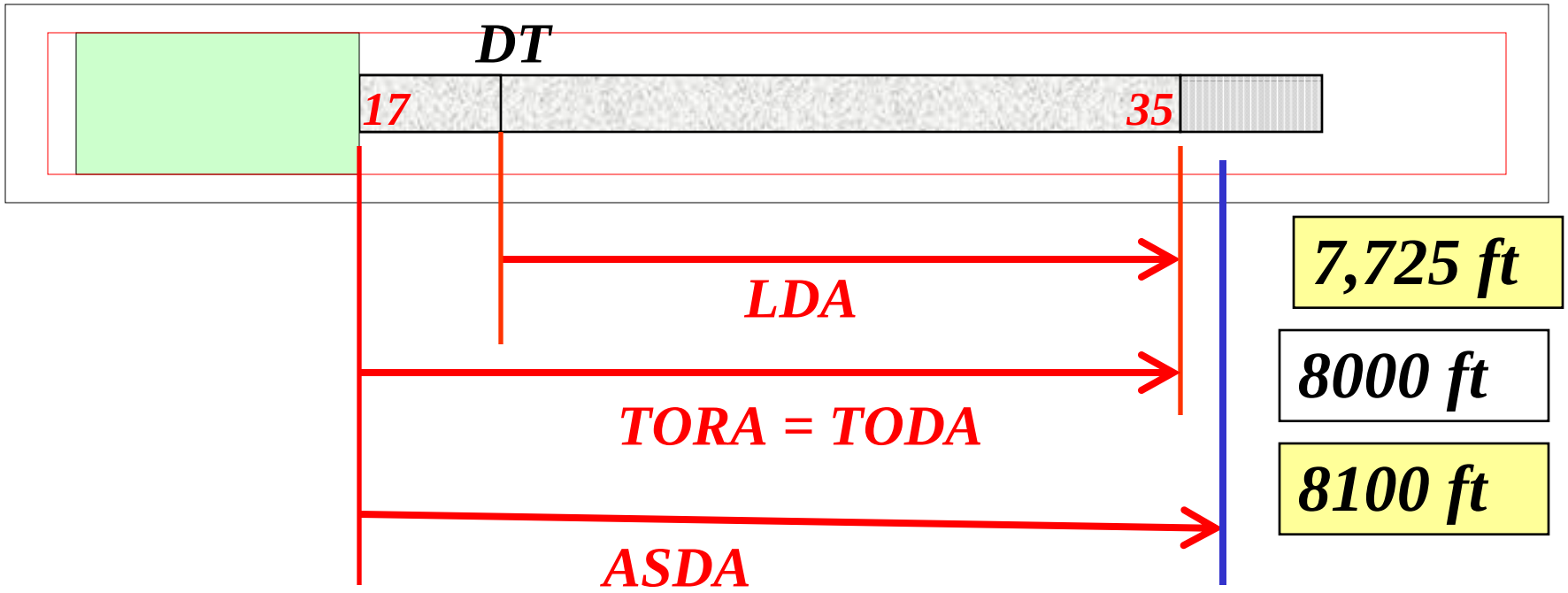
CLEARWAY @

700 FT

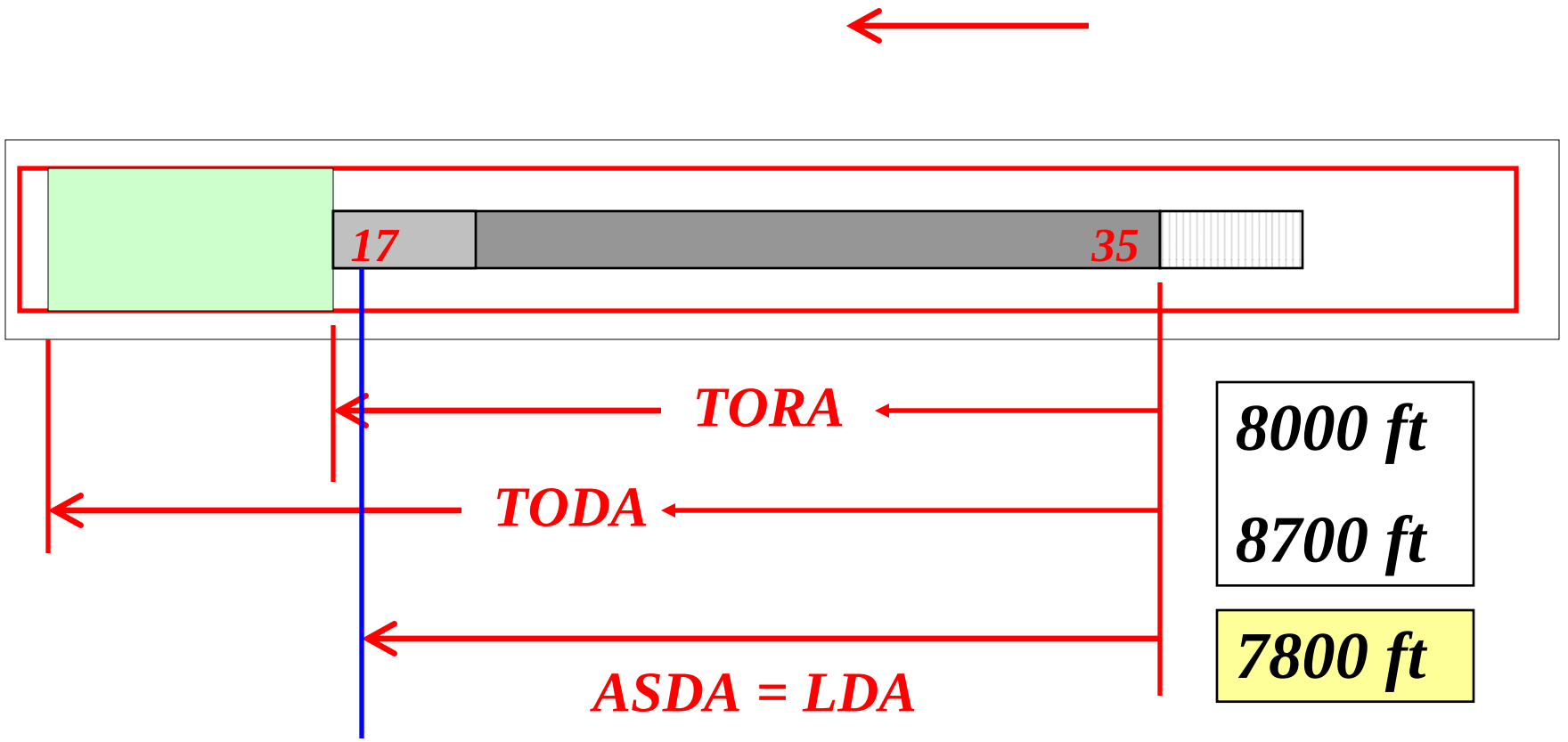
STOPWAY @
300 FT

Note: Stopway cannot be used by ASDA as RSA

Declared Distances for RWY 17



Declared Distances for RWY 35



Rwy 17/35 Declared Distances

Runway End	*TORA ft*	*TODA ft*	*ASDA ft*	*LDA ft*
17	*8000*	*8000*	*8100*	*7725*
35	*8000*	*8700*	*7800*	*7800*

Pilots - Why the reductions for ASDA, LDA ?

“ Insufficient RSA ”

Revision to the AIM
Aeronautical Information Manual

- **DRAFT – AIM GUIDANCE ON DECLARED DISTANCES – DRAFT**
  - **(Intended to replace AIM 4-3-6 c)**
- **AIM 4-3-X Declared Distances**
  - ***REFERENCE-***
  - ***Pilot/Controller Glossary Terms, "Accelerate-Stop Distance Available", "Landing Distance Available", "Takeoff Distance Available", and "Takeoff Run Available".***
- Declared distances for a runway represent the maximum distances available and suitable for meeting takeoff and landing distance performance requirements. These distances are determined in accordance with FAA runway design standards by adding to the physical length of paved runway any clearway or stopway designated by the airport operator *and* ***subtracting*** *from that sum any lengths necessary to obtain the* ***standard runway safety areas***, runway object free areas, or runway protection zones required for the runway. As a result of these additions and subtractions, *the declared distances for a runway may be more or less than the physical length of the runway as depicted on the Airport Diagram* published by the US Government or commercially produced (meeting FAA requirements) aeronautical charts.

- More draft Text …….

INSTRUMENT APPROACH PROCEDURES (CHARTS)

AIRPORT DIAGRAM/AIRPORT SKETCH

Runways

Hard Surface | Other Than Hard Surface | Stopways, Taxiways, Parking Areas, Water Runways | Displaced Threshold

Closed Runway | Closed Taxiway | Under Construction | Metal Surface

ARRESTING GEAR: Specific arresting gear systems; e.g., BAK12, MA-1A etc., shown on airport diagrams, not applicable to Civil Pilots. Military Pilots refer to appropriate DOD publications.

uni-directional | bi-directional | Jet Barrier

ARRESTING SYSTEM

REFERENCE FEATURES

Buildings
Tanks
Obstructions
Airport Beacon #
Runway
Radar Reflectors
Control Tower #
Hot Spot

When Control Tower and Rotating Beacon are co-located, Beacon symbol will be used and further identified as TWR.

Runway length depicted is the physical length of the runway (end-to-end, including displaced thresholds if any) but excluding areas designated as stopways.

A (D) symbol is shown to indicate runway declared distance information available, see appropriate A/FD, Alaska or Pacific Supplement for distance information.

Helicopter Alighting Areas

Negative Symbols used to identify Copter Procedures

landing point

Runway Threshold elevation.....THRE 123
Runway TDZ elevation.....TDZE 123
Runway Slope.....0.8% UP / 0.3% DOWN
(shown when runway slope is greater than or equal to 0.3%)

NOTE:
Runway Slope measured to midpoint on runways 8000 feet or longer.

U.S. Navy Optical Landing System (OLS) "OLS" location is shown because of its height of approximately 7 feet and proximity to edge of runway may create an obstruction for some types of aircraft.

Approach light symbols are shown in the Flight Information Handbook.

Airport diagram scales are variable.

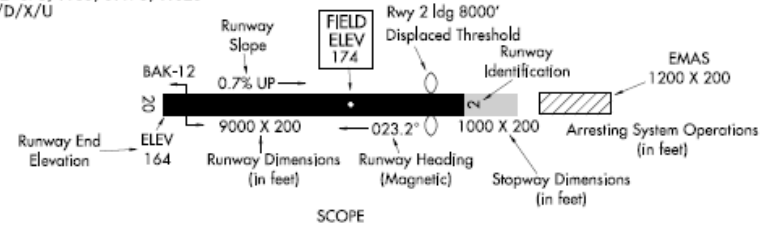
True/magnetic North orientation may vary from diagram to diagram

Coordinate values are shown in 1 or ½ minute increments. They are further broken down into 6 second ticks, within each 1 minute increments.

Positional accuracy within ±600 feet unless otherwise noted on the chart.

NOTE:
All new and revised airport diagrams are shown referenced to the World Geodetic System (WGS) (noted on appropriate diagram), and may not be compatible with local coordinates published in FLIP. (Foreign Only)

Runway Weight Bearing Capacity/or PCN Pavement Classification Number is shown as a codified expression.
Refer to the appropriate Supplement/Directory for applicable codes e.g.,
RWY 14-32 S75, T185, ST175, TT325
PCN 80 F/D/X/U



SCOPE

Airport diagrams are specifically designed to assist in the movement of ground traffic at locations with complex runway/taxiway configurations and provide information for updating Computer Based Navigation Systems (I.E., INS, GPS) aboard aircraft. Airport diagrams are not intended to be used for approach and landing or departure operations. For revisions to Airport Diagrams: Consult FAA Order 7910.4.

30 JUL 2009 to 27 AUG 2009

30 JUL 2009 to 27 AUG 2009

Runway length depicted is the physical length of the runway (end-to-end, including displaced thresholds if any) but excluding areas designated as stopways.

A (D) symbol is shown to indicate runway declared distance information available, see appropriate A/FD, Alaska or Pacific Supplement for distance information.

Part IV

Related Items

How to minimize DD reductions

ORDER 5200.8 - RUNWAY SAFETY AREA PROGRAM

- ***Objective:*** ***All RSAs at Federally obligated airports and Part 139 airports are to comply with the RSA Standards in AC 150/5300-13, Airport Design***
  - ***Several alternatives to achieve Full or Partial Compliance*** ***(Appendix 2, Para 3), Examples include:***
    - ***Runway Reduction,***
    - ***Declared Distances, and***
    - ***EMAS*** ***(Note #4 or #6, Tables 3-1, 3-2, 3-3, AC 150/5300-13)***

EMAS installation off Runway 22L at JFK

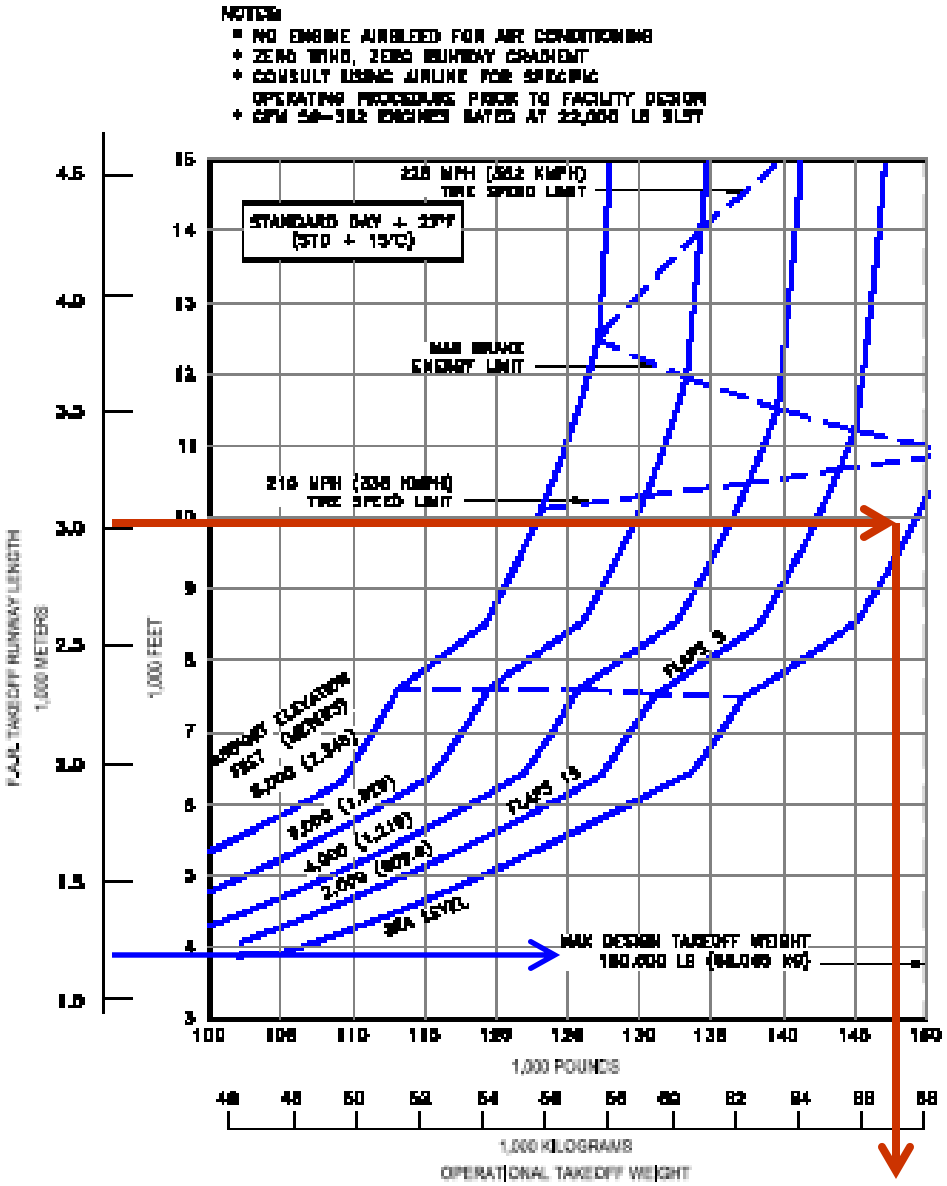
SAAB-340 overrun in June 1999

- ***Order 5200.9 – Financial Feasibility And Equivalency Of RSA Improvements And EMAS***
  - ***<u>Purpose</u> – Provides Guidance in 2 areas, one being, comparing various RSA improvement alternatives that use EMAS:***
    - ***Standard EMAS Installations***
    - ***Modified Standard EMAS Installations***
    - ***Policy – Use Declared Distances and EMAS to achieve a standard RSA***

As the airport operator, I am doing this and that to obtain Standard RSAs.

Can ***the users*** of my airport help?

Rwy 10,000 ft



AIRPORT

500 ft Above Sea Level

Takeoff Weight Restriction

1,540 KG

3,700 Lbs

S.3.18 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

STANDARD DAY +27°F (STD + 15°C)

MODEL 737-400 (CFM56-3B-2 ENGINES AT 22,000 LB SLST)

Same Aircraft

737-400 Series

Same Hot Day

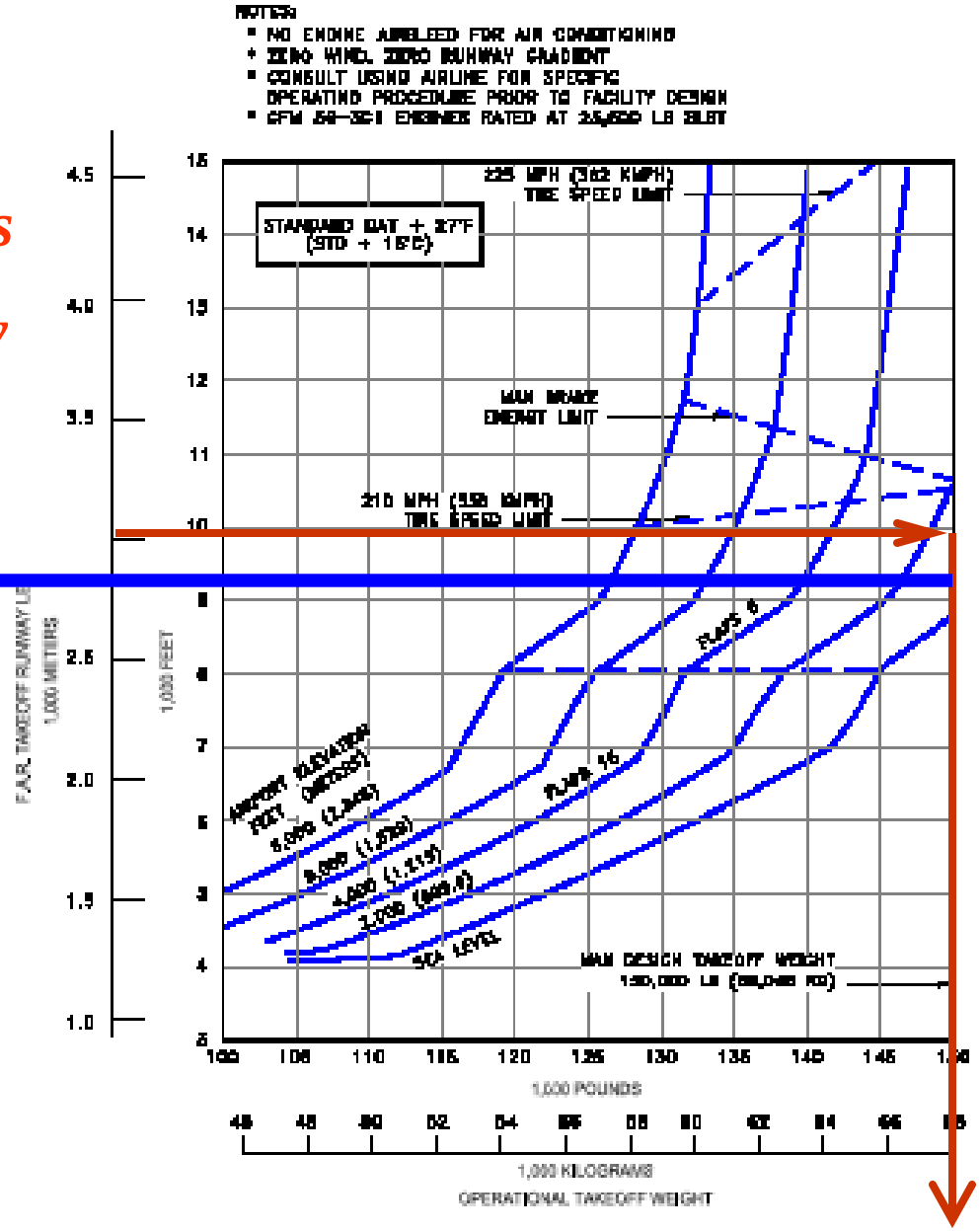
Rwy 10,000 ft

9,300 ft

Or

Extra

700 ft



AIRPORT

500 ft Above Sea Level

No Takeoff Weight Restriction

WHY?

3.3.18 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

STANDARD DAY +27°F (STD + 15°C)

MODEL 737-400 (CFM56-3C1 ENGINES AT 23,500 LB SLST)

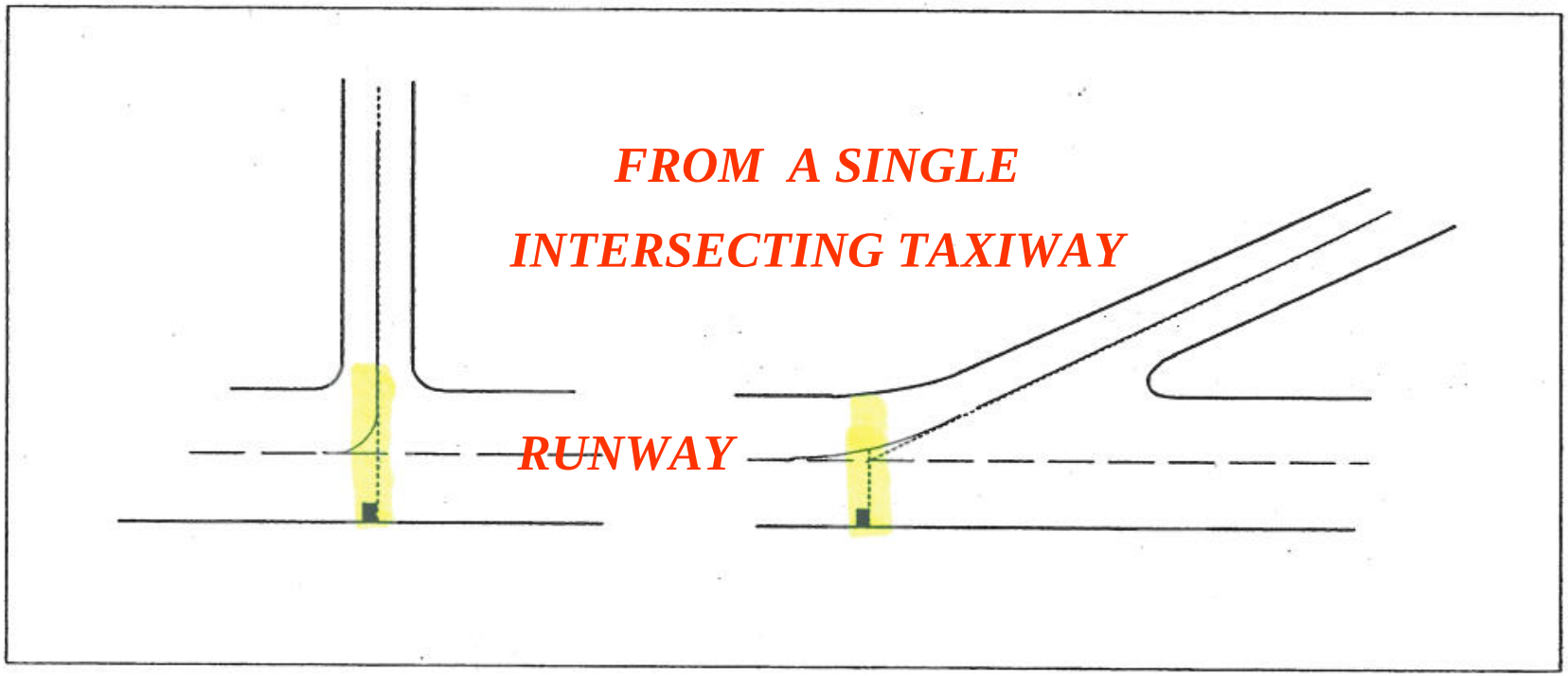
D6-58325-6

Benefits ?

- ***This aircraft is not weight restricted***
- ***This takeoff operation uses approx. 9,300 ft not 10,000 feet***
- ***Offers 700 feet for the RSA***

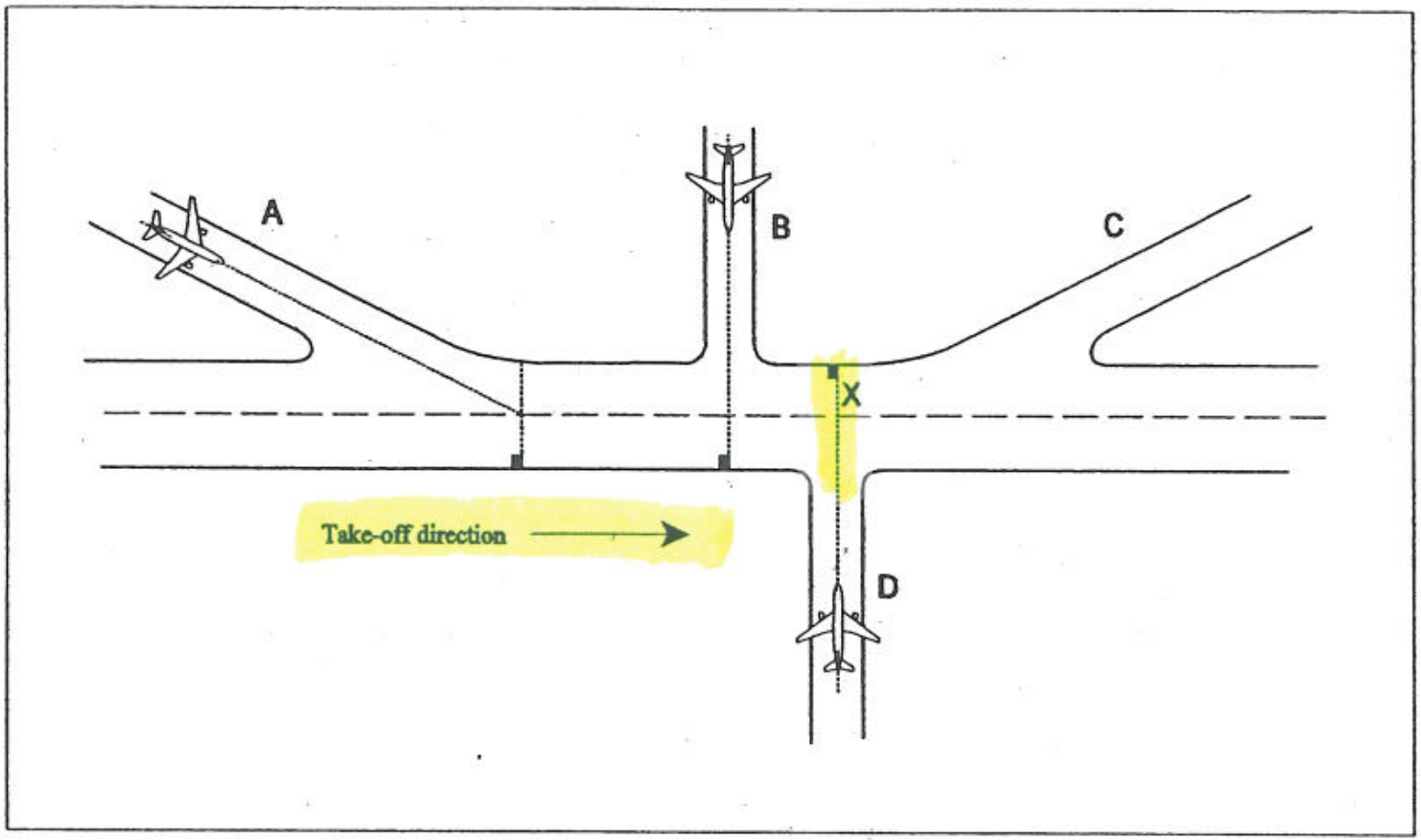
Declared Distances and Intersecting Twys

- FAA recommended practice follows ICAO
- Usable taxiways with “shortest,” reduced DD
- Report only [not published] to ATCT:
  - ***R-TORA, R-TODA, R-ASDA***



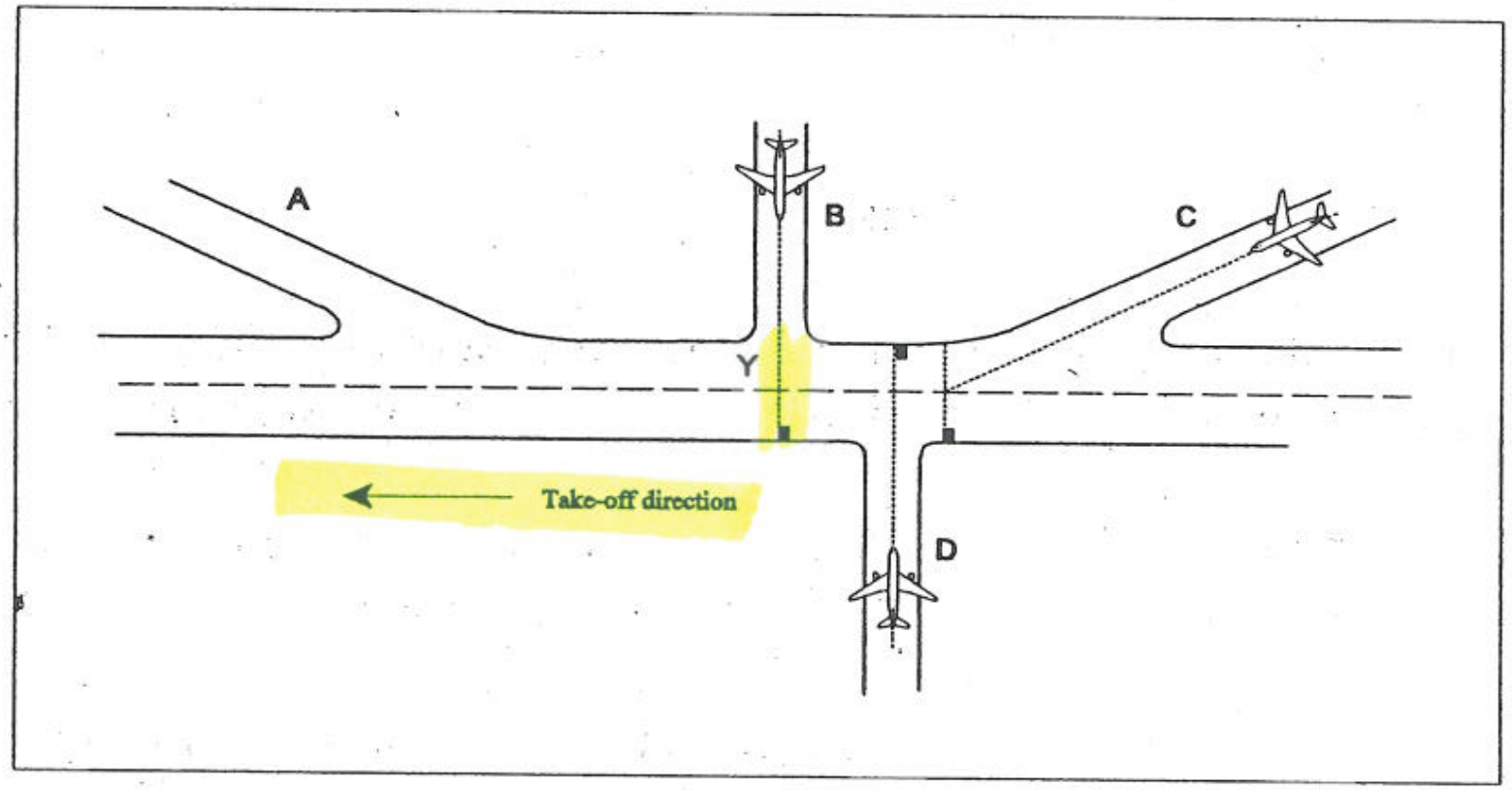
Multi-Twy Entrances

- Usable Twys A, B, and D. Not Twy C
- Shortest distances are from D



Multi-Twy Entrances

- Usable Twys B, C, and D. Not Twy A
- Shortest distances are from B



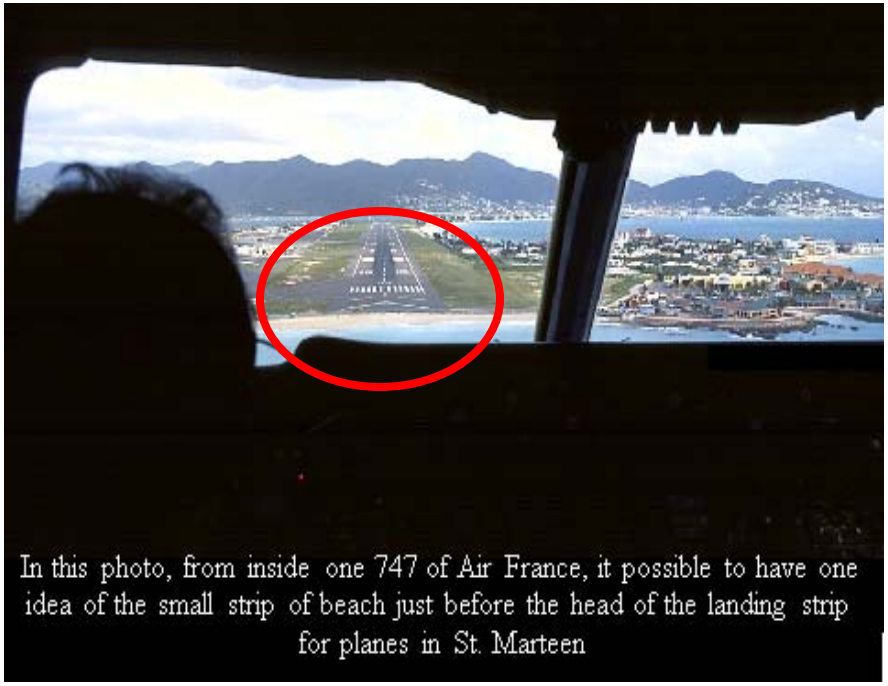
Part V

US FAA/Airports Global Safety Initiatives

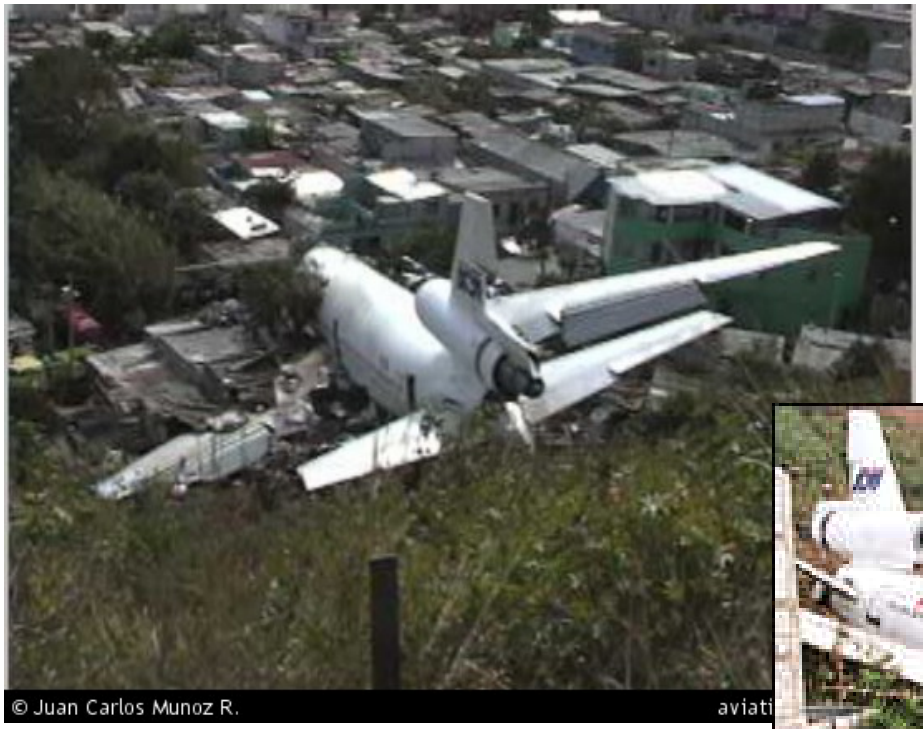
The use of Declared Distances, EMAS under ICAO

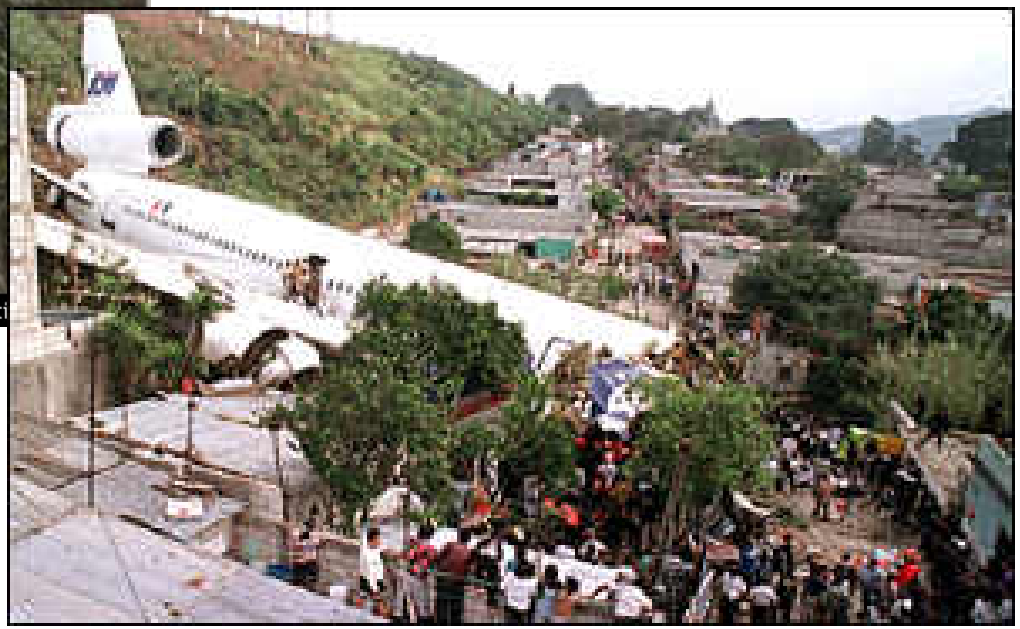
Sint Maartin / Saint Martin The Caribbean

Flight deck view of the runway and beach view of the landing aircraft on final approach to St. Maarteen



Steep terrain off Runway 01
Guatemala City, Guatemala
La Aurora International Airport



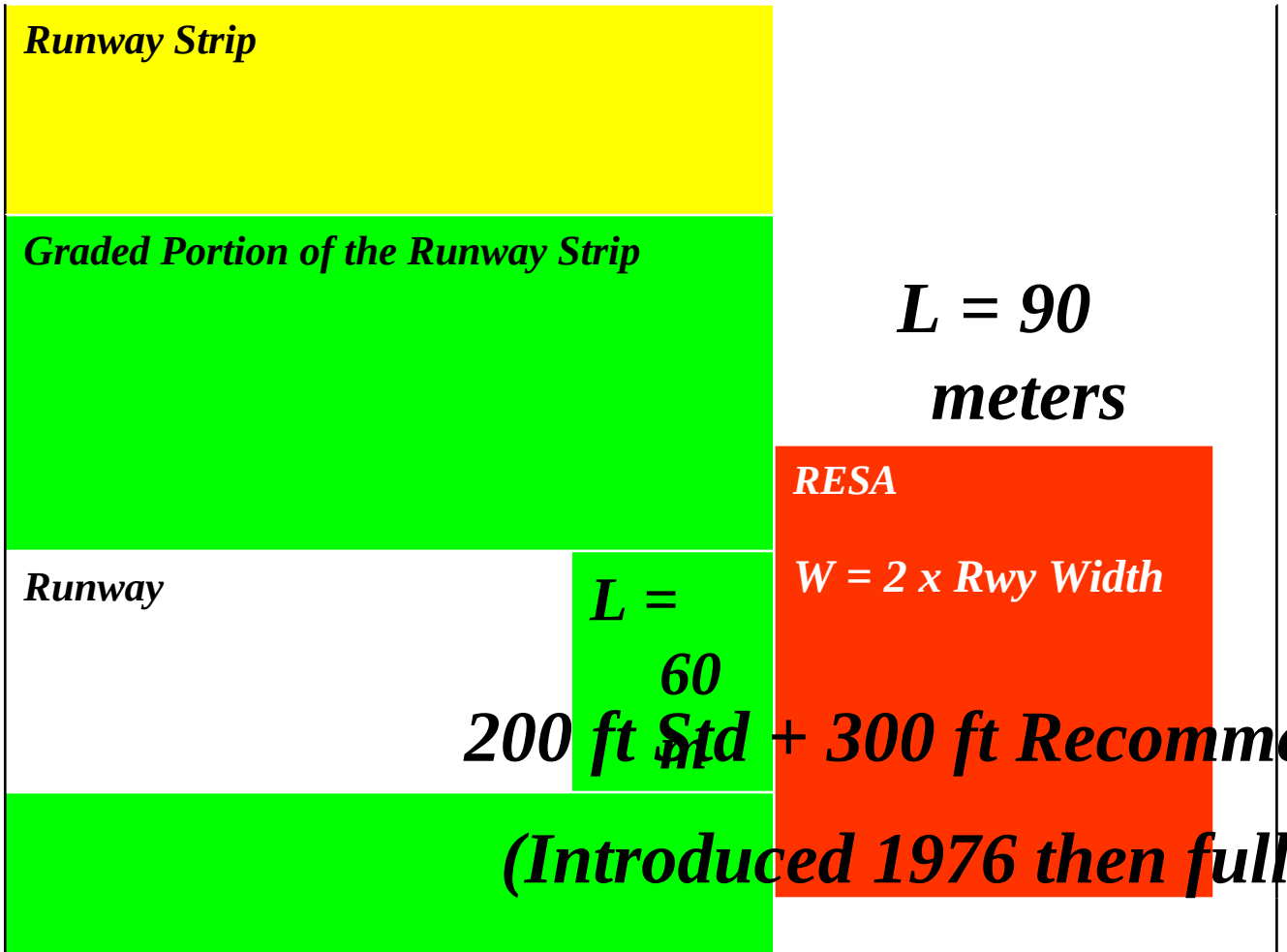


McDonnell Douglas DC-10-30
Dec 21, 1999

ICAO **---** Schematic of a runway, runway strip, graded portion of the runway strip, and the

runway end safety area (RESA)

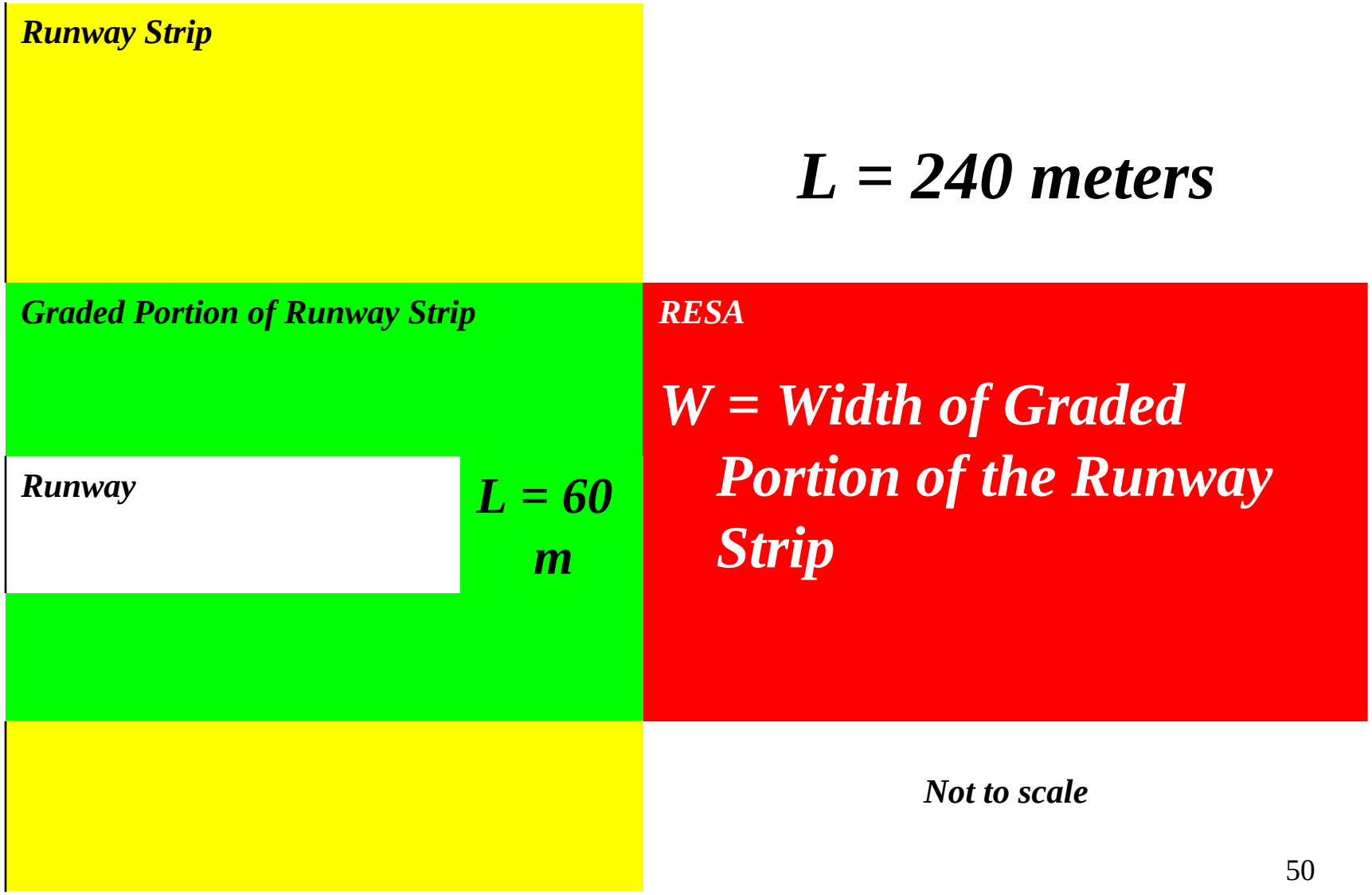
FAA Safety Initiative #1



200 ft Std + 300 ft Recommendation

(Introduced 1976 then full std 1999)

FAA Safety Initiatives #2 and #3



Status ?

- ***RESA Elevated from a Recommended Practice to a Standard – Done***
- ***Longer/wider RESA Adopted as Recommended Practices – Done***
- ***Elevate new Recommended Practices to Standard – Not Completed – Difficult – Efforts underway to reduce the recommended values – need validation thru accident data***

Just like some U.S. Airports, We too are land constrained. Help!

- ***FAA Safety Initiatives #4 and #5***
- ***Gain Acceptances for RSA Related Credits:***
  - ***EMAS and***
  - ***Declared Distances***
- ***ICAO review is favorable for such credits – draft recommendations moving forward***

Questions ?